

*Carex rostrata*, Stokes. This species, which Mr. C. H. Bissell has reported from Salisbury, the extreme northwestern town of the State (RHODORA, V. 33), occurs also in the town of Franklin, in the southeastern section of the State. It is abundant here in a wet sphagnous bog near Ayer's Mountain.

Mr. M. L. Fernald has kindly examined the above mentioned plants, and pronounces them correctly named.

NEW HAVEN, CONNECTICUT.

## COASTAL PLAIN PLANTS IN NEW ENGLAND.

ROLAND M. HARPER.

THE coastal plain of the Eastern United States is defined as that part of the country adjoining the Atlantic and Gulf coasts and underlaid by Mesozoic and Cenozoic rocks. From the mouth of the Hudson River to the Rio Grande and beyond, it extends in an uninterrupted belt of varying width but with unmistakable characters, differing considerably from other parts of the country not only in soil, topography and flora but even in population. In the Atlantic states, where the coastal plain is bordered on the west by the Piedmont region of ancient crystalline rocks, its inland boundary is very well marked, and is known as the fall-line, because most of the rivers which cross it have falls or rapids at the point of intersection. The fall-line passes through or near the following cities (and determines the location of most of them):—New York, Trenton, Philadelphia, Baltimore, Washington, Richmond, Raleigh, Columbia, Augusta, Macon and Columbus. West of Georgia the inland boundary of the coastal plain is said to be less conspicuous, but it has been traced from Tuscaloosa, Ala., almost due north to the southern extremity of Illinois, thence southwestward into Mexico.

East of New Jersey there is no genuine fall-line, but most of Long Island, Cape Cod, and the islands of southern New England also belong to the coastal plain, according to definition, though owing to certain geological peculiarities these regions are not quite typical, and are usually discussed separately.

Several interesting papers have been written on the occurrence of "pine-barren plants" on Staten Island, Long Island, and the coastal

plain portions of New England, but the authors of some of them have not stated just what pine-barren plants are, except by implying that they are such species as are found also in the well known "pine-barrens" of New Jersey. It would have been better however to say coastal plain plants, for many of these species range farther south, where they are not confined to the pine-barrens which constitute only a part of the fully developed coastal plain.

But almost anywhere in the interior of New England, over the older rocks whose affinity is with those of the Piedmont region of the Middle and South Atlantic states, can be found species (or even larger groups) of plants which in the South are confined to the coastal plain, or nearly so. This fact has been overlooked by most botanists, doubtless because until quite recently there have been few local floras in which a sharp distinction is made between the coastal plain and the older parts of the country. Since the beginning of the present century however there have appeared two excellent state floras, Mohr's *Plant Life of Alabama* and Gattinger's *Flora of Tennessee*, in which such a distinction is made. These can now be supplemented by some of the writer's own observations in Georgia, most of which have not been previously published.

If we study the ranges of these coastal plain plants which occur in New England we find that most of them extend not only southward near the coast but also westward through the northern states to Minnesota or thereabouts, the northern part of their ranges coinciding approximately with the area of Glacial drift. The Drift, as is well known, covers almost the whole of New England, islands and all; and its southern boundary may be located approximately on the map by a line passing through New York, St. Louis, Kansas City, and thence northwestward. The drift overlaps the coastal plain east of New York, and a little in southern Illinois, but in the longitude of Cincinnati, Chattanooga, and Columbus, Georgia ( $85^{\circ}$  W.), the two areas are 500 miles apart.

Nearly all the plants to be discussed below do not range farther west than the 100th meridian, either in the glaciated area or in the coastal plain, the climate of the Great Plains region being too arid for them. It happens that every state east of the Plains contains either coastal plain or glacial drift, or both, hence no gap in the range of any species confined to these two regions is evident from a manual in which ranges are given only or chiefly by states.

In the following list are enumerated some species or genera

which have such a distribution as above described, and are rare or absent in the intervening territory. Under each one the words preceded by "west" refer to its range in the glaciated area, and those preceded by "south" to its range in the coastal plain. It is taken for granted that their ranges in New England and north and east of there, as well as their habitats, are known to the reader. The ranges given have been compiled from several well known works, but are liable to the errors usually inherent in compilations. These notes may serve however as a foundation for more accurate work in the future.

Except where otherwise specified, these plants have all been observed by the writer in the coastal plain of Georgia (and about half of them in central Massachusetts also). Most species whose coastal plain range does not reach Georgia are not considered here.

*Woodwardia Virginica* (L.) J. E. Smith. West to Michigan and northwestern Indiana, south to Florida, Arkansas and Texas.

*Lycopodium* (species of the *inundatum* group). In New England and elsewhere in the same latitudes *L. inundatum* is almost the sole representative of this group, but in the southern states there are three species, all confined to the coastal plain, except that *L. pinna-tum* has been collected once in the Piedmont region of Georgia,<sup>1</sup> and the other two have each been collected at least once in western North Carolina.<sup>2</sup> No member of this group is reported from Tennessee.

*Chamaecyparis thyoides* (L.) B. S. P. West to eastern Indiana (*S. Coulter*), south to Florida and Mississippi. In the South it has a rather erratic distribution (apparently skipping Georgia completely), but seems to be strictly confined to the coastal plain.<sup>3</sup>

*Potamogeton*. This genus is abundantly represented in the glaciated region, less so in the coastal plain, and almost wanting in the Piedmont region and mountains.

*Echinodorus parvulus* Engelm. West to Minnesota and Missouri, south to Florida and Texas (?).<sup>4</sup>

*Sagittaria graminea* Mx. West to Nebraska and the Dakotas, south to Florida, western Tennessee and Texas.

<sup>1</sup> See Bull. Torr. Bot. Club, 30: 294, 326. 1903.

<sup>2</sup> See Lloyd & Underwood, Bull. Torr. Bot. Club, 27: 155, 157. 1900.

<sup>3</sup> See Torrey, 3: 122. 1903; and Pinchot & Ashe, Timber Trees and Forests of North Carolina, 120. 1898.

<sup>4</sup> See Robinson, RHODORA, 5: 89. 1903.

*Sagittaria natans*, Mx. South to Florida and Alabama.

*Dulichium arundinaceum* (L.) Britton. West to Minnesota and Nebraska, south to Florida, Tennessee and Texas.

*Eleocharis interstincta* (Vahl) R. & S. West to Michigan and northern Indiana, south to Florida and Texas. (Also in the West Indies and Mexico).

*Eleocharis mutata* (L.) R. & S. Distribution very similar to that of the preceding.

*Eleocharis Robbinsii*, Oakes. West to Michigan, south to Florida. (But apparently not yet detected in most of the states between Delaware and Georgia.)<sup>1</sup>

*Eleocharis melanocarpa* (Baldw.) Torr. West to Indiana,<sup>2</sup> south to Florida. (Also in the West Indies.)

*Eleocharis tuberculosa* (Mx.) R. & S. West to Pennsylvania, south to Florida, Arkansas and Texas. Also rarely in western Middle Georgia.<sup>3</sup>

*Scirpus Hallii*, Gray. West to Illinois and Missouri,<sup>4</sup> south to Florida.

*Eriophorum Virginicum*, L. West to Saskatchewan and Nebraska, south to Florida (but rare southward). Also in the Cumberland Mountains of Tennessee (*Gattinger*). The other American species of this genus seem to be confined to the glacial drift, or nearly so.

*Fuirena squarrosa*, Mx. (and some closely related forms or varieties). West to Michigan and Nebraska, south to Florida and Louisiana. The variety *hispida* also occurs rarely in Middle Georgia.

*Rhynchospora fusca* (L.) Ait. f. West to Michigan, south to Florida. (But apparently not yet reported from Virginia and the Carolinas.)<sup>5</sup> Also in the Cumberland Mountains of Tennessee (*Gattinger*), and in Europe. *R. alba* has a somewhat similar distribution, and one species (*R. capillacea*) seems to be confined to the drift, but the other North American *Rhynchosporae*, some fifty in number, are principally confined to the coastal plain.

*Cladium mariscoides* (Muhl.) Torr. West to Minnesota and Iowa,

<sup>1</sup> See Bull. Torr. Bot. Club, 30: 323. 1903.

<sup>2</sup> See E. J. Hill, Bull. Torr. Bot. Club, 25: 392. 1898.

<sup>3</sup> See Bull. Torr. Bot. Club, 30: 294, 326. 1903.

<sup>4</sup> Material from the Rocky Mountain region formerly referred to this species was separated by Mr. Fernald a few years ago. (RHODORA, 3: 251. 1901.)

<sup>5</sup> See Bull. Torr. Bot. Club, 30: 324. 1903.

south to Florida and Alabama (but apparently not known between Delaware and Georgia).

*Scleria verticillata*, Muhl. West to Michigan and Indiana, south to Florida and Texas. Also in Mexico and the West Indies.

*Lemna*. This genus has about the same distribution in America as *Potamogeton*.

*Orontium aquaticum*, L. West to the Pocono plateau of Pennsylvania, south to Florida, Missouri and Texas. Also rarely in northwest Georgia (*Harper*) and adjacent Tennessee (*Gattinger*).

*Xyris*. The North American species are nearly all confined to the coastal plain,<sup>1</sup> except *X. flexuosa* and *X. montana*, which are rather widely distributed in the glaciated region.

*Eriocaulon*. Represented in New England only by *E. septangulare*, With., which ranges west to Minnesota, and south in the coastal plain to Florida and Mississippi (but it is not definitely known in the States between New Jersey and Georgia). The other North American species seem to be confined to the coastal plain, except that *E. decangulare* is known from a few stations in the mountains of North Carolina and Tennessee.

*Pontederia cordata*, L. West to Minnesota and Saskatchewan, south to Florida, Arkansas and Texas. Also at one station in Middle Tennessee (*Gattinger*).

*Juncus scirpoides*, Lam. West to Indiana, south to Florida, Arkansas and Texas.

*Tofieldia*. Represented in eastern North America by two species in the glacial region (one of them also occurring in the mountains of North Carolina) and two others in the coastal plain, one ranging from New Jersey to Louisiana and the other known only from the Carolinas.

*Gyrotheca tinctoria* (Walt.) Salisb. Seems to be confined to the coastal plain, ranging from New England to Florida and Mississippi. Also in Cuba.

*Habenaria ciliaris* (L.) R. Br. West to Michigan and northern Indiana, south to Florida, Arkansas and Louisiana. Also rarely in Northwest Georgia (*P. Wilson*), northern Alabama (*Mohr*), and East Tennessee (*Gattinger*).

*Habenaria blephariglottis* (Willd.) Torr. West to Minnesota, south

<sup>1</sup> See Bull. Torr. Bot. Club, 30: 326. 1903.

to Florida and Louisiana. (But apparently not yet known in Virginia and the Carolinas.)

*Myrica*. All the American representatives of this genus seem to be confined to the glacial region and coastal plain (except that Dr. Mohr has reported *M. pumila* from one station in upper Alabama). One species, *M. Carolinensis*, Mill. (until recently confused with the more southern *M. cerifera*, L.), is common to both regions, but with a striking diversity of habitat. In central Massachusetts it grows principally in rocky pastures, in Virginia on the dunes along the coast, and in Georgia usually on sandy margins of swamps.

*Sarracenia purpurea*, L. West to Minnesota and British Columbia (?), south to Florida and West Tennessee. The other six species of the genus are confined to the coastal plain, except that two or three of them occur locally in Western North Carolina and the mountains of Alabama (possibly also in upper Georgia).

*Drosera filiformis*, Raf. South to Florida and Mississippi, but not extending very far from the coast. This genus seems to be almost wanting in the Piedmont region and southern mountains.

*Rosa Carolina*, L. West to Minnesota, south to Florida, Arkansas and Louisiana. (Not reported from Alabama.)

*Aronia arbutifolia* (L.) Ell. West to the Dakotas and Nebraska, south to Florida, Arkansas and Louisiana. Also in the mountains of Tennessee (*Gattinger*) and rarely in Middle Georgia.

*Polygala cruciata*, L. West to Minnesota and Kansas (?), south to Florida and Louisiana. Also in East Tennessee (*Gattinger*) and western Middle Georgia.<sup>1</sup>

*Ilex glabra* (L.) Gray. Almost confined to the coastal plain. South to Florida and Louisiana. Also in Carroll County, Middle Georgia (*C. L. Boynton*).<sup>2</sup>

*Viola lanceolata*, L. West to Minnesota, south to Georgia and Texas. Also in the mountains of Tennessee (*Gattinger*).

*Decodon verticillatus* (L.) Ell. West to Minnesota (?), south to Florida and Louisiana. Also rarely in Northwest Georgia (*P. Wilson*) and Tennessee (*Gattinger*), but probably not found in the Blue Ridge and Piedmont region.

*Rhexia Virginica*, L. West to Indiana and Kansas, south to Flor-

<sup>1</sup> See Bull. Torr. Bot. Club, 30: 294. 1903.

<sup>2</sup> Biltmore Bot. Stud. 1: 144, 145. 1902.

ida, Louisiana and Arkansas. Also at several interior points, but most abundant in the coastal plain.

*Ludwigia sphaerocarpa*, Ell. South to Florida and Louisiana (?). Seems to be confined to the coastal plain.

*Proserpinaca pectinata*, Lam. Distribution similar to that of the preceding.

*Hydrocotyle umbellata*, L. West to Minnesota (?), south to Florida and Texas. Also in the tropics.

*Ptilimnium capillaceum* (Mx.) Raf. West to Minnesota (?), south to Florida and Texas.

*Clethra alnifolia*, L. South to Florida and Louisiana. Apparently confined to the coastal plain except in New England,<sup>1</sup> and nowhere more than 200 miles from the coast.

*Azalea viscosa*, L. West to Ohio, south to Florida, Arkansas and Texas. Also reported from the mountains of Tennessee and Alabama.

*Leucothoe racemosa* (L.) Gray. South to Florida, Louisiana and Missouri. Also in East Tennessee (*Gattinger*).

*Pieris Mariana* (L.) B. & H. South to Florida and Arkansas. Also in the mountains of Tennessee (*Gattinger*). Not reported from Alabama.

*Gaylussacia dumosa* (Andr.) T. & G. South to Florida and Louisiana in the coastal plain. Also on the sunny slopes of some of the mountains of Georgia, and at a few other interior localities,<sup>2</sup> but apparently never more than 300 miles from the coast.

*Sabbatia dodecandra* (L.) B. S. P. South to North Carolina near the coast, and replaced farther south by two or three species recently separated from this, all confined to the pine-barren region.

*Limnanthemum lacunosum* (Vent.) Griseb. West to Minnesota, south to Florida, Mississippi, West Tennessee, Arkansas and Louisiana.

*Gerardia paupercula* (Gray) Britton. Nearly throughout the glaciated region, also in the pine-barrens of Georgia and Alabama, but not yet reported from intermediate stations.

*Gerardia Skinneriana*, Wood. West to Minnesota and Iowa, south to Florida and Louisiana. In Georgia confined to the pine-barrens.

<sup>1</sup> See RHODORA, 2: 70. 1900.

<sup>2</sup> See Small, Bull. Torr. Bot. Club, 21: 18, 19. 1894.

*Pinguicula*. The North American species are confined to the glaciated region and to the pine-barrens from North Carolina southwestward, but none are common to the two regions.

*Utricularia inflata*, Walt. South to Florida, West Tennessee, and Texas.

*Utricularia purpurea*, Walt. West to northern Indiana, south to Florida and Alabama.

*Utricularia resupinata*, B. D. Greene. West to Michigan and northern Indiana. Also in the pine-barrens of Georgia and Florida, but not yet reported from intermediate stations.

*Utricularia cornuta*, Mx. West to Minnesota, south to Florida and Louisiana. (Not reported from Alabama or Tennessee.) In Georgia confined to the pine-barrens.

*Utricularia subulata*, L. South to Florida, Arkansas, and Texas. Also in the tropics.

*Eupatorium verbenaefolium*, Mx. South to Florida and Louisiana in the coastal plain. Also in East Tennessee (*Gattinger*) and Pike County, Middle Georgia.<sup>1</sup>

It will be noticed by persons familiar with the above-mentioned plants that they all grow either in or around ponds, in wet meadows, or in sandy or sphagnous bogs; but many of them exhibit what ecologists term xerophytic structures. (The explanation of this apparent anomaly of structure is usually sought in the properties of the soil, but it would seem that illumination has just as much to do with it, for with few exceptions they are sun-loving plants). And as Dr. Hollick noted in the case of the northern "pine-barren" plants, they are nearly all endemic to eastern North America.

No mention has been made of weeds, for their distribution is so erratic as to be of little significance in this connection; or of plants of salt marshes and dunes, for they occur along the coast in almost any part of the world, regardless of whether a coastal plain is present or not.

In the case of the true aquatics in the above list their distribution is easily accounted for by the fact that there are no natural ponds in the Blue Ridge and Piedmont region, the two principal pond-forming agencies, glaciers and limestone, never having been present in those parts. (Even in the middle of the coastal plain of Georgia there is

<sup>1</sup> See Bull. Torr. Bot. Club, 30: 294. 1903.

an area of at least 10,000 square miles where most of these aquatics are wanting for a similar reason.)

For the distribution of the other plants under consideration the explanation is probably to be found in the nature of the soil. It happens that almost the whole surface of the coastal plain is covered with unconsolidated sedimentary deposits (principally the Lafayette and Columbia formations) which are of about the same age as the glacial drift and resemble it to a considerable extent in chemical and physical composition. The Columbia in particular, the newest and uppermost, is often (perhaps usually) composed of almost pure sand, scarcely distinguishable from the more sandy phases of the drift. Streams rising in that part of the country covered by Pleistocene sands (whether Columbia or glacial) are rarely or never muddy but usually discolored with vegetable matter, while in the Piedmont region clay soil and muddy streams predominate (giving rise to the impression common among some people who have traveled a little that all Southern rivers are muddy).

The plants under discussion all grow on these well washed Pleistocene sands or in peaty deposits overlying them, all of which are very deficient in available plant food. Peat-bogs are not confined to cool climates as some may suppose (because of their abundance in the glaciated regions in which most scientists live, both in North America and Europe), but are equally characteristic of the coastal plain. Okefinokee Swamp, in the extreme southern part of Georgia, with an average annual temperature of about 70° F. (and less rainfall than almost any other part of that state), is mainly a vast peat-bog, containing about the same proportions of sphagnum, ferns, carnivorous herbs, Ericaceous shrubs and coniferous trees as the well known cedar-swamps of New England (and with not a few species in common).

It will be noticed that (taking the Engler & Prantl sequence as a criterion) most of the species above mentioned stand rather low in the scale (for vascular plants, the lower cryptogams not being considered here), also that there are few trees and shrubs among them. This is doubtless due to the comparative newness and sterility of the soil in which they grow. It is well known that when a soil is first thrown open to settlement for plants, as in an area recently emerged from the sea or laid bare by glaciers, it is first taken possession of by the lowest forms of vegetation, such as algae, lichens and mosses,

which gradually modify and enrich the soil, thus paving the way for higher plants. Those here discussed seem to be all species which take very little nourishment from the soil, and some of them (the *Sarracenias*, *Droseras*, *Pinguiculas* and *Utricularias*) depend on the animal kingdom for a part of their sustenance.

On examining the ranges of these plants it will be noticed that a few of them do not extend very far inland in the glaciated region, but whether this has any special significance or not it is difficult to say. Quite a number which were formerly thought to be confined to the vicinity of the coast have since turned up near the Great Lakes, in the upper Mississippi valley, or at other interior points. The great gaps in the known ranges of some are surprising, but may be due only to imperfect exploration.

The origin of species having ranges like those above described is an interesting question. During the Pleistocene period the glacial region and coastal plain were both uninhabitable (one being covered with ice and the other with water) and before that their soils were very different from what they are now, so it is almost certain that most of the species at present chiefly confined to those regions have originated since then. The few which now occupy isolated stations in the Piedmont region and southern mountains may of course have been there before the Pleistocene, but it seems more likely that they have migrated there in comparatively recent times from the regions where they are now much more abundant.

The glaciated region, like the coastal plain, doubtless has its own endemic species, but to attempt to enumerate them would be beyond the scope of this paper, and would require more knowledge of that region than the writer possesses.

All the above remarks are intended to be merely suggestive, rather than exhaustive and the list here given can doubtless be considerably extended by further study. With the increased attention that botanists are now paying to geography we may reasonably expect a great deal of new light on the subject in the near future. In tracing ranges for phytogeographical purposes care must always be taken to discriminate against introduced plants, whether introduced from foreign countries or from other parts of the same state. In few local floras is such a distinction made. The *Nymphaeaceae* and some other aquatics are particularly liable to appear in new localities through the indirect agency of man, establishing themselves readily in artificial ponds and ditches outside of their natural range.

In pursuing this subject further the following works will be found helpful:—

BAILEY, W. W. Pine barren plants in Rhode Island. Bull. Torr. Bot. Club, 7: 98, 99. 1880.

BRITTON, N. L. On the northward extension of the N. J. pine-barren flora on Long and Staten Islands. Bull. Torr. Bot. Club, 7: 81-83. 1880.

COULTER, S. A catalogue of the flowering plants and of the ferns and their allies indigenous to Indiana. Ann. Rep. Geol. Ind. 24: 553-1074. 1901.

COWLES, H. C. The physiographic ecology of Chicago and vicinity. Bot. Gaz. 31: 73-108, 145-182. 1901.

CURTIS, M. A. Botany of North Carolina. Raleigh, 1867.

GATTINGER, A. Flora of Tennessee (ed. 2). 184 pp. Nashville, 1901.

HOLLICK, A. Plant distribution as a factor in the interpretation of geological phenomena, with special reference to Long Island and vicinity. Trans. N. Y. Acad. Sci. 12: 189-202. 1893.

KEARNEY, T. H., JR. The Lower Austral element in the flora of the Southern Appalachian region. Science, II. 12: 830-842. 1900.

MACMILLAN, C. The Metaspermae of the Minnesota Valley. 826 pp. Minneapolis, 1892.

MCGEE, W. J. The Lafayette formation. 12th Ann. Rep. U. S. Geol. Surv. 1: 347-521. 1891.

MOHR, C. Plant Life of Alabama. Contr. U. S. Nat. Herb. 6. 921 pp. 1901.

PORTER, T. C. Flora of the Pocono Plateau. RHODORA, 1: 182-185. 1899.

SHALER, N. S. Report on the geology of Martha's Vineyard. 7th Ann. Rep. U. S. Geol. Surv. 297-363. 1888.

SHALER, N. S. General account of the fresh-water morasses of the United States. 10th Ann. Rep. U. S. Geol. Surv. 1: 255-339. 1890.

SHALER, N. S. The origin and nature of soils. 12th Ann. Rep. U. S. Geol. Surv. 1: 213-345. 1891.

SHALER, N. S. Geology of the Cape Cod district. 18th Ann. Rep. U. S. Geol. Surv. 2: 497-593. 1898.

TRANSEAU, E. N. On the geographic distribution and ecological relations of the bog-plant societies of northern North America. Bot.

Gaz., 36: 401-420. 1903. (In this paper, by an arbitrary selection of species, the apparent preponderance of bog-plants in the glacial region, as compared with the southern coastal plain, is greatly exaggerated.)

WRIGHT, G. F. The Ice Age in North America. 622 pp. New York, 1889.

In some of these works will be found numerous other references, leading to a long chain of interesting literature.

COLLEGE POINT, Long Island, New York.

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HIERACIUM MURORUM IN MASSACHUSETTS. — On the 15th of June, 1904, while exploring in the woods on the outskirts of Northampton, Massachusetts, I found in a damp, mossy hollow, a yellow flower belonging to the *Compositæ*, which was new to me. I took it home for study, and made it out to be *Hieracium murorum*, L. My only hesitation in so naming it arose from the fact that the plant was not credited to New England, in any of the books. However, I sent it to Mr. Fernald, who pronounced it good *Hieracium murorum*. There was quite a colony of it growing in the hollow, and the bright yellow blossoms in the mossy bed made a very attractive sight.—EMILY HITCHCOCK TERRY, Northampton, Massachusetts.

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ACTINELLA ODORATA IN MAINE.—*Actinella odorata*, Gray, a native of the Southwest (Texas, Mexico, etc.), was found at Waterville, Maine, last summer, by Mr. S. Plaisted. It was growing on waste from a cotton mill and was in bloom in June. A specimen was sent to the Gray Herbarium, where it was identified by Dr. J. M. Greenman, who states that the species has not been reported from Maine.—A. R. MEADER, Waterville, Maine.

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